Space Weather Technical Forecast

Issued on Sunday, 16 October 2022 at 13:05 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

---

Space Weather Forecast Headline: No significant space weather is expected.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity over the past 24 hours has been Low, with an isolated long period C6.1 flare peaking at 15/1432 UTC from ex-AR3112. This region, located beyond the northwest limb is now transiting the far side of the solar disc. There are currently four numbered regions on the visible disc. All regions are small and magnetically rather simple, with only AR3124 (now Cai/Beta) in the southwest quadrant showing recent consistent growth.

There are also a number of filaments on the Earth-facing disc. One of these in the southwest erupted around 15/1430 UTC, with a possible faint CME visible in imagery. Modelling was attempted and results do not indicate any significant Earth directed ejecta. No other Earth-directed CMEs have been observed.

Solar Wind / Geomagnetic Activity: The solar wind, as observed by ACE and DSCOVR at L1, showed ongoing connection with CH32. A slow rising trend was evident from around 510 km/s to around 580 km/s, with brief peaks just above 600km/s. Density was steady at near, or just above average levels. The IMF was at weak levels, between 4nT and 8nT. The north-south component, Bz, fluctuated between +/-7nT. The phi angle was mostly negative (towards the Sun). Geomagnetic activity was mainly Quiet to Unsettled (Kp 1 to 3), with Active periods 15/1800-2100UTC, and 16/0900-1200UTC.

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) as measured at GOES16, has remained at background levels. High energy electron flux at GOES16 (greater than 2MeV) was predominantly at Background levels. The associated fluence was well below the Active (1e8 integrated pfu) threshold. The 15/2359 UTC observation was 1.73e6 integrated pfu.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is forecast to be Low or Very Low, barring any significant sunspot development on the visible disc.

Solar Wind / Geomagnetic Activity: There are currently no Earth-directed CMEs, however there is a low chance that peripheral effects of CMEs passing south of Earth late day 1 (16th) or early day 2 (17th), and again late on day 2 into 3 (17th-18th) may be observed. Otherwise, ongoing fast wind influence from CH32/- is expected to gradually ease towards background. Geomagnetic activity is forecast to be Quiet to Unsettled, but with a chance of isolated Active intervals day 1 (16th) from ongoing fast wind effects, or with any possible influence from the potential glancing CMEs late day 1 (16th) or early day 2 (17th), and again late on day 2 (17th) into day 3 (18th).

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10MeV) is

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

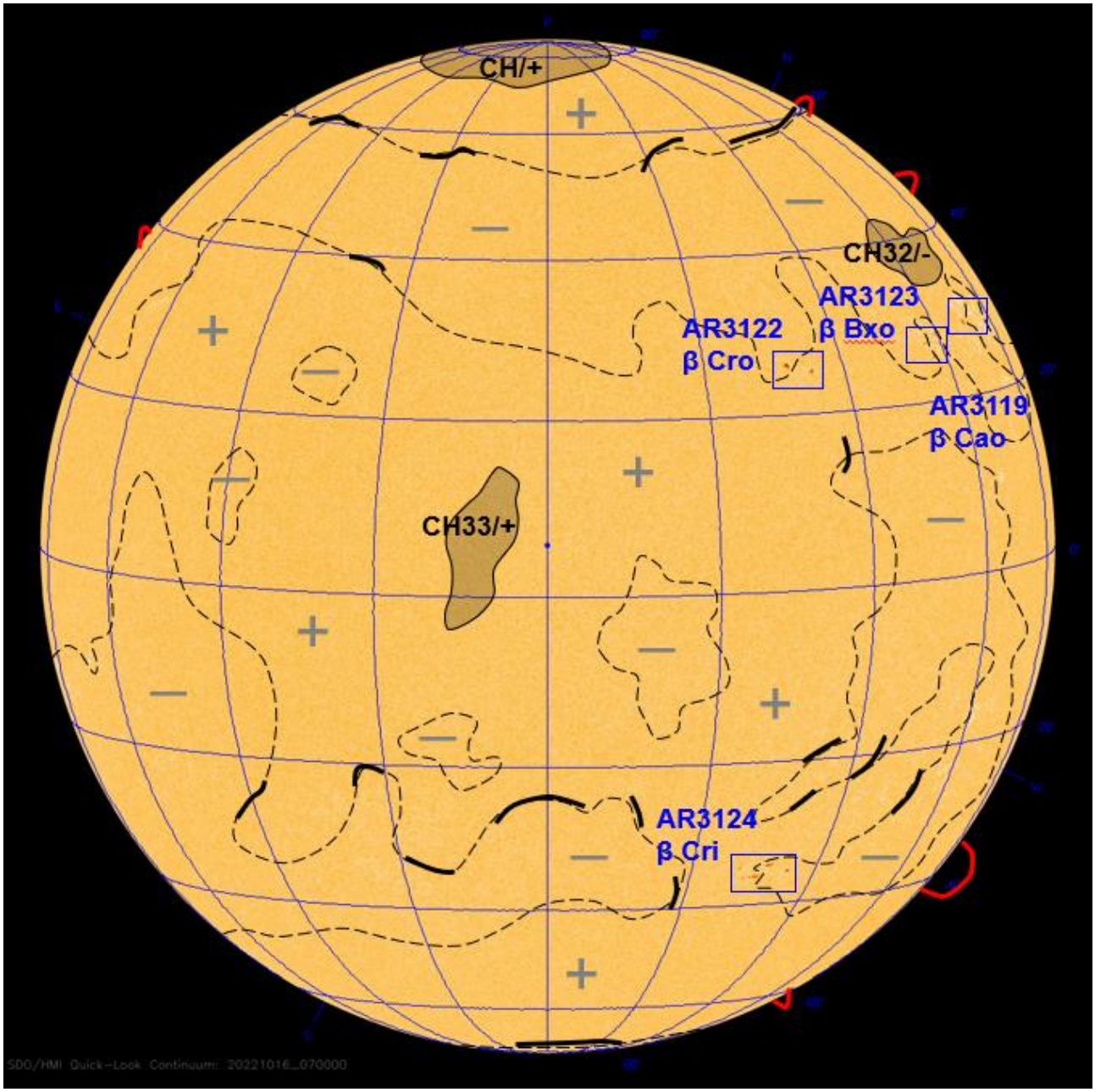
© Crown Copyright 2022. All Rights Reserved.

expected to be at background levels. High energy electron flux (greater than 2MeV) has eased to near background levels, although flux levels may recover during the period, perhaps reaching High at diurnal peak, although this is ow confidence. The associated 24hr fluence is expected to persist below the Active (1e8 integrated pfu) threshold, but with a likely rising trend.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2022. All Rights Reserved.

Figure 1. Solar Analysis Valid 16/0700UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2022. All Rights Reserved.

Met Office Space Weather Technical Forecast

Geomagnetic Storms:

There are no Earth-directed CMEs, however a CME was observed from a filament eruption from the southern centre disc early on the 13th. The bulk of the material is expected to pass below Earth's orbit, however peripheral glancing effects are possible, most likely late day 1 (16th) or early day 2 (17th). Similarly, another filament erupted in the southwest at 14/2200 UTC. Modelled results indicate that the bulk of the ejecta will also pass below Earth orbit, and although a weak glance late on day 2 (17th) or early day 3 (18th) is possible, no significant impacts are anticipated.

Current fast wind enhancement from CH32/-, is expected to gradually ease back towards background through the period.

Geomagnetic activity is forecast to be Quiet to Unsettled, but with a chance of isolated Active intervals day 1 (16th) from ongoing fast wind effects, or with any possible influence from the potential glancing CMEs late day 1 (16th) or early day 2 (17th), and again late on day 2 (17th) into day 3 (18th).

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	5	5	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

Date/time 21.5R (UTC)	Halo: Full or Partial	Source	Source Location	Estimated Speed	Estimated Arrival Time	Comments
13/1610	Partial	Filament eruption	S-centre	408km/s	Missing	Chance of peripheral influence late 16th or early 17th
15/0600	Partial	Filament eruption	SW	520km/s	Missing	Low Chance of peripheral influence late 17th or early 18th

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2022. All Rights Reserved.

Met Office Space Weather Technical Forecast

Radio Blackouts - X-Ray Flares:

Solar activity over the past 24 hours has been Low, with an isolated long period C6.1 flare peaking at 15/1432 UTC from ex-AR3112. This region, located beyond the northwest limb is now transiting the far side of the solar disc. However, there remains a very slight risk of an isolated M-flare through day 1 (16th), reducing thereafter.
There are currently four numbered regions on the visible disc. All regions are small and magnetically rather simple, with only AR3124 (now Cai/Beta) in the southwest quadrant showing recent consistent growth.

A returning region may begin to appear at the southeast limb by the end of the period.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	5	3	1	1
Very Active	R3 to R5 X Class	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) as observed by GOES-16 is currently at background levels and expected to remain at this level.

Radiation Storms	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	1	1	1	1
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2022. All Rights Reserved.

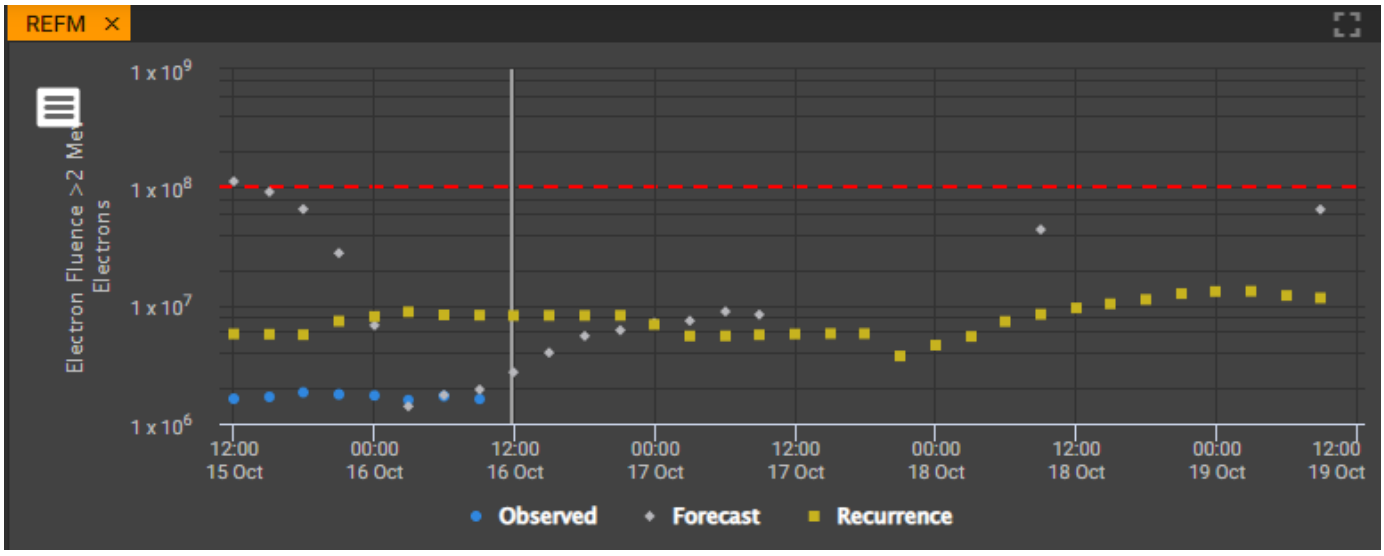
High Energy Electrons Event (≥ 2MeV):

High energy electron flux (greater than 2MeV) as observed by GOES-16 has been at background, having dropped out due to impact of the recent fast wind arrival from CH32/-. Electron flux may increase again once solar winds ease, rising to Moderate, and perhaps reaching High at the diurnal peak, although with low confidence.

The associated 24 hour electron fluence is likely to remain below the Active level, but with a rising trend should flux levels increase. There is a chance that this may approach the Active threshold by day 3 or day 4 (18th or 19th), but again confidence is low. REFM has begun to correct for the current fast winds and the rising trend in fluence levels is accepted, although the rate of potential increase uncertain, and will most likely remain below the Active level.

GEO Electron Environment	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ 2 MeV ≥ $1x10^8$	No	5	20	30	30
Very Active	≥ 2 MeV ≥ $1x10^9$	No	1	1	1	1

Figure 2: MOSWOC REFM latest output.



Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2022. All Rights Reserved.